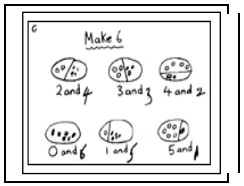
St Andrew's CE VA PRIMARY SCHOOL

Calculation Policy

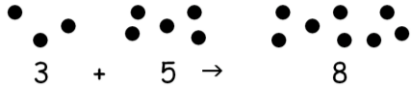
Addition

Stage 1

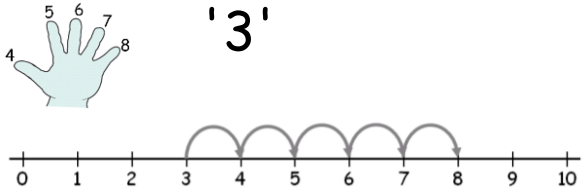
Children are encouraged to develop a mental picture of the number system in their heads to use for calculation. They develop ways of recording calculations using pictures, etc.



Count all – a child doing 3 + 5 counts out three counters and then five counters and then finds the total by counting all the counters.



Count on from the first number – a child finding 3 + 5 counts on from the first number: *'four, five, six, seven, eight'*.



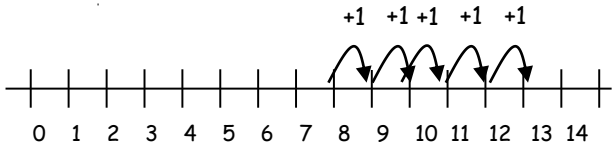
Count on from the larger number - 3 + 5 a child chooses the larger number, even when it is not the first number, and counts on from there: *'six, seven, eight'*

'5'

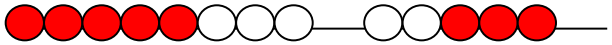
Stage 2

Children then begin to use numbered lines to support their own calculations using a numbered line to count on in ones.

8 + 5 = 13



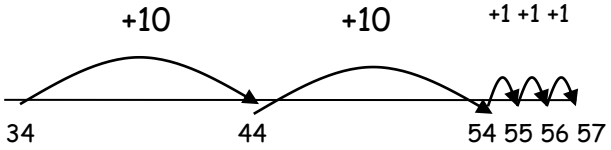
addition including bridging through ten by counting on 2 then counting on 3.



Children will begin to use 'empty number lines' themselves starting with the larger number and counting on.

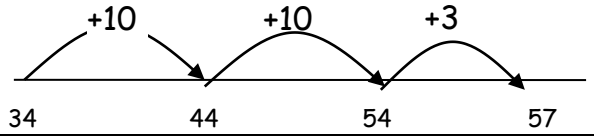
✓ First counting on in tens and ones.

34 + 23 = 57



✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).

34 + 23 = 57

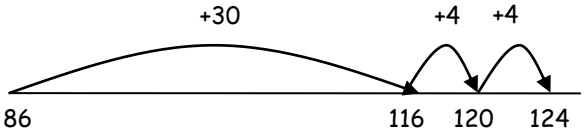


Stage 3

Children will continue to use empty number lines with increasingly large numbers, including compensation where appropriate.

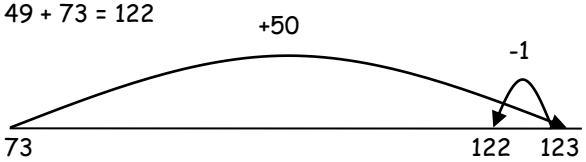
✓ Count on from the largest number irrespective of the order of the calculation.

38 + 86 = 124



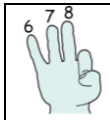
✓ Compensation

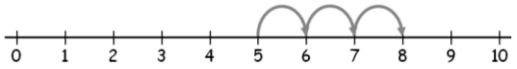
49 + 73 = 122



Children use informal pencil and paper methods (jottings) to support, record and explain partial mental methods building on existing mental strategies. They begin to use an expanded layout that underpins the standard written method

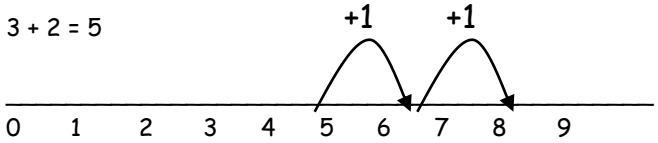
$$\begin{array}{rll} 85 & = 80 + & 5 \\ +\ \underline{46} & \underline{40 + } & \underline{6} \\ & 120 + 11 & = 131 \end{array}$$





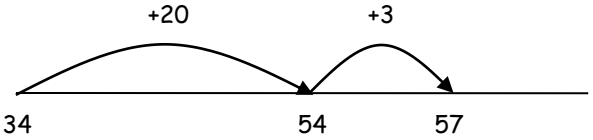
They use numberlines and practical resources to support calculation and teachers *demonstrate* the use of the numberline.

3 + 2 = 5



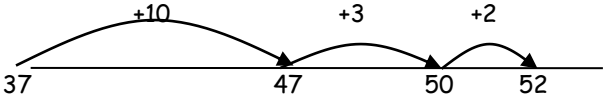
- ✓ Followed by adding the tens in one jump and the units in one jump

34 + 23 = 57



- ✓ Bridging through ten can help children become more efficient.

37 + 15 = 52



Addition

Stage 4

Adding the least significant digits first

```
  67
+ 24
  11 ( 7 + 4)
  80 (60 + 20)
  91
```

```
  267
+  85
   12   ( 7 + 5 )
  140   ( 60 + 80 )
  200   ( 200 + 0 )
  352
```

Children will consolidate the above and move on to carrying below the line.

```
  625
+  48
  673
   1
```

```
  783
+  42
  825
   1
```

```
  367
+  85
  452
  11
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more three-digit sums of money, with or without adjustment from the pence to the pounds;*
- ✓ *know that the decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. £3.59 + 78p.*

Stage 5

Children should extend the carrying method to numbers with at least four digits.

```
  587
+ 475
 1062
  11
```

```
  3587
+  675
  4262
  111
```

Using similar methods, children will:

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 3.2 m – 280 cm.*

Stage 6

Children should extend the carrying method to number with any number of digits.

```
  7648
+ 1486
 9134
 111
```

```
  6584
+ 5848
 12432
 111
```

```
   42
 6432
  786
    3
+ 4681
 11944
  121
```

Using similar methods, children will

- ✓ *add several numbers with different numbers of digits;*
- ✓ *begin to add two or more decimal fractions with up to four digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other, particularly when adding or subtracting mixed amounts, e.g. 401.2 + 26.85 + 0.71*

Subtraction

Stage 1

Children develop ways of recording calculations using pictures etc.

Counting back – taking away

There were five frogs. Two jumped into the pond. How many were left?

1 less than 10

1 **less** than 10 is 9

10 **subtract** 1 equals 9

10 – 1 = 9

A chocolate bar cost 8p. The shopkeeper had a sale and took 3p off. How much does the chocolate bar cost now?

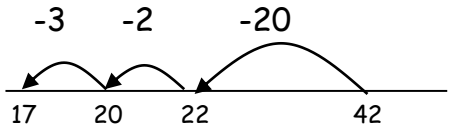
Stage 2

Children will begin to use **empty number lines** to support calculations.

Counting back – taking away

- ✓ Counting back in tens then ones.
- ✓ Then helping children to become more efficient by subtracting the units in one jump (by using the known fact 7 – 3 = 4).
- ✓ Subtracting the tens in one jump and the units in one jump.
- ✓ Bridging through ten can help children become more efficient.

42 – 25 = 17

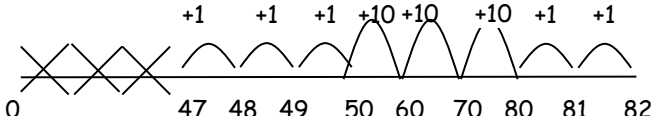


Counting on – finding a difference

Count up from 47 to 82 in jumps of 10 and jumps of 1.

The number line should still show 0 so children can cross out the section from 0 to the smallest number. They then associate this method with 'taking away'.

82 – 47



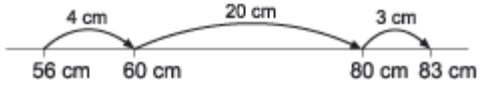
Stage 3

Children will continue to use **empty number lines** with increasingly large numbers.

Counting on – finding a difference

Children continue to count on in the context of problem solving

e.g. Two snakes are 56 cm and 83 cm long. What is the difference in their lengths?

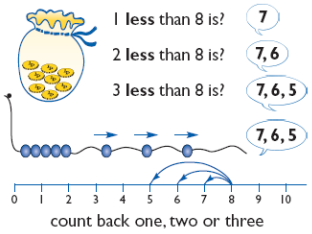


Counting back – take away/partitioning

Children develop their use of the empty number line to support their calculations. They **begin to record subtraction calculations vertically** that cannot be easily done mentally. They partition one of the numbers and add or subtract the units, tens and hundreds separately:

267 – 149

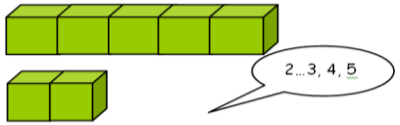
267
– 9
258
– 40
218
–100
118



10 and 4 less

Counting on – finding a difference

Max has 5 cubes. Milly has 2 cubes. How many more cubes does Max have?

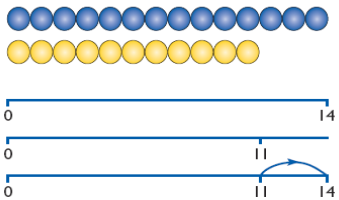


How many less/fewer cubes does Milly have?
What is the difference between?

A teddy costs 50p and doll costs 20p. How much more does the teddy cost?

How much cheaper is the doll?

If my friend is 14 and his sister is 11, how much older is my friend?



The difference between 11 and 14 is 3.

$14 - 11 = 3$

$11 + \square = 14$

How much younger is his sister?

Partitioning and decomposition

89 = 80 + 9

− 57 50 + 7

30 + 2 = 32

Initially, the children will be taught using examples that do not need the children to exchange.

From this the children will begin to exchange.

The calculation should be read as e.g. take 6 from 1.

71 =

− 46

Step 1 70 + 1

− 40 + 6

Step 2 60

~~70~~ + $^{1}1$

− 40 + 6

20 + 5 = 25

Children should know that units line up under units, tens under tens, and so on.

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

Subtraction

Stage 4

Partitioning and decomposition

754 =
- 86

Step 1 700 + 50 + 4
- 80 + 6

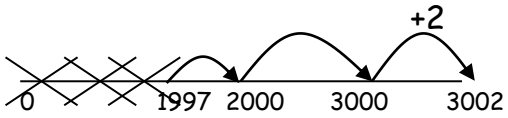
Step 2 700 + 40 + 14 *(adjust from T to U)*
- 80 + 6

Step 3 600 + 140 + 14*(adjust from H to T)*
- 80 + 6
600 + 60 + 8 = 668

This would be recorded by the children as

600 140
~~700~~ + ~~50~~ + 14
- 80 + 6
600 + 60 + 8 = 668

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.



Stage 5

Decomposition

When children are secure with the previous method they move on to decomposition.

614 1
~~7~~~~5~~4
- 86
668

Children should:

- ✓ *using this method, children should also begin to find the difference between two three-digit sums of money, with or without 'adjustment' from the pence to the pounds;*
- ✓ *know that decimal points should line up under each other.*

Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *begin to find the difference between two decimal fractions with up to three digits and the same number of decimal places;*
- ✓ *know that decimal points should line up under each other.*

NB If your children have reached the concise stage they will then continue this method through into year 6. They will not go back to using the expanded methods.

Where the numbers are involved in the calculation are close together or near to multiples of 10, 100 etc counting on using a number line should be used.

Stage 6

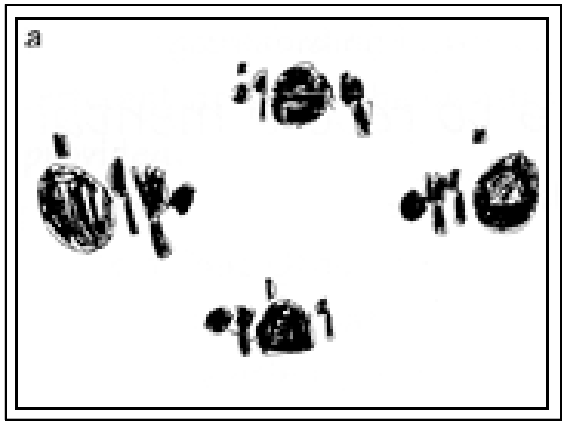
Children should:

- ✓ *be able to subtract numbers with different numbers of digits;*
- ✓ *be able to subtract two or more decimal fractions with up to three digits and either one or two decimal places;*
- ✓ *know that decimal points should line up under each other.*

Multiplication

Stage 1

Children will experience equal groups of objects and will begin to count in 2s, 10s and 5s. They will work on practical problem solving activities involving equal sets or groups.



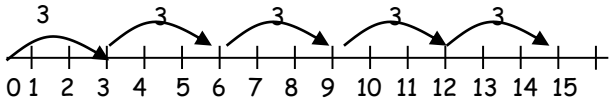
Stage 2

Children will develop their understanding of multiplication and use jottings to support calculat ion:

Repeated addition

Repeated addition can be shown easily on a number line:

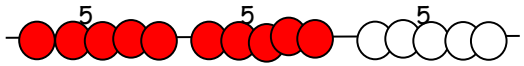
5 x 3 = 3+3+3+3+3 (5 lots of 3)



✓ **Commutativity**

Show on bead bar or on a number line:

3 x 5 = 5 + 5 + 5



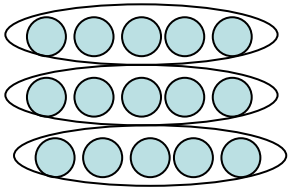
Stage 3

Children will continue to use:

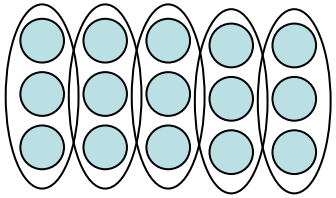
Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.

✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method



3 x 5 = 15



5 x 3 = 15

✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon

5cm 20 cm

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

☐ x 5 = 20 3 x △ = 18 ☐ x O = 32

Multiplication

Stage 4

Children will continue to use arrays where appropriate leading partitioning

✓ **Partitioning**

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

Grid method

TU x U

(Short multiplication – multiplication by a single digit)

23 x 8

Children will approximate first
23 x 8 is approximately 25 x 8 = 200

x	20	3
8	160	24

160
+ 24
184

Stage 5

Grid method

HTU x U

346 x 9
Children will approximate first
346 x 9 is approximately 350 x 10 = 3500

x	300	40	6
9	2700	360	54

2700
+ 360
+ 54
31 1 4
1 1

TU x TU

72 x 38
Children will approximate first
72 x 38 is approximately 70 x 40 = 2800

x	70	2
30	2100	60
8	560	16

2100
+ 560
+ 60
+ 16
2736
1

Stage 6

HTU x TU

372 x 38

x	300	70	2
30	9000	2100	60
8	2400	560	16

9000
+ 2400
+ 2100
+ 560
+ 60
+ 16
14136

Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first.

5c - Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first.

For example: 4.92 x 3

x	4	0.9	0.02
3	12	2.7	0.06

12
+ 0.7
+0.06
12.76

Children will approximate first
4.92 x 3 is approximately 5 x 3 =15

They then move on to the vertical expanded method:

38
X 7
56 (7 x 8)
210 (7 x 30)
266

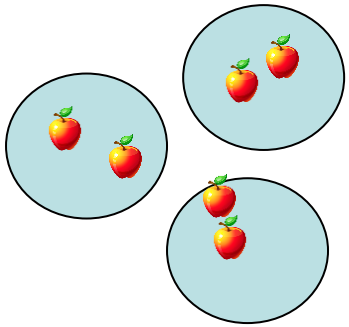
Lastly on to compact work

38
X 7
266
2 5

Division

Stage 1

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

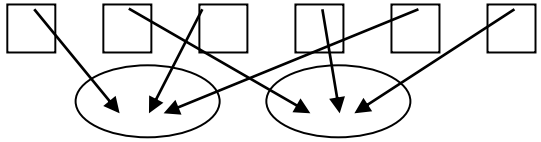


Stage 2

Children will develop their understanding of division and use jottings to support calculation

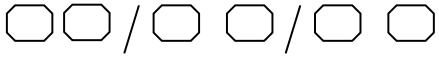
✓ **Sharing equally**

6 sweets shared between 2 people, how many do they each get?



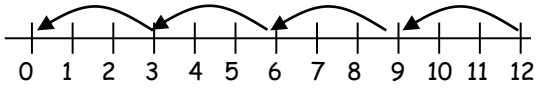
✓ **Grouping or repeated subtraction**

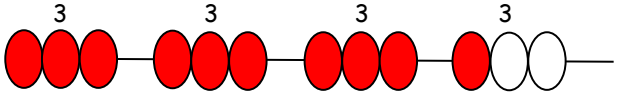
There are 6 sweets, how many people can have 2 sweets each?



✓ **Repeated subtraction using a number line or bead bar**

12 ÷ 3 = 4





✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

□ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ △ = 4

Stage 3

Ensure that the emphasis is now on grouping rather than sharing.

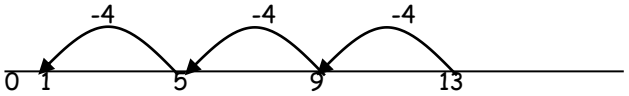
Children will continue to use:

✓ **Repeated subtraction using a number line**

Children will use an empty number line to support their calculation.

Children should also move onto calculations involving remainders.

13 ÷ 4 = 3 r 1



✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

26 ÷ 2 = □ 24 ÷ △ = 12 □ ÷ 10 = 8

+1000
+3

Division

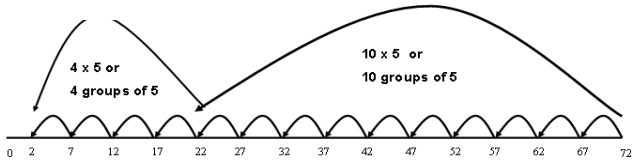
Stage 4

Children will develop their use of repeated subtraction to be able to subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

TU ÷ U

72 ÷ 5 = 14 r 2

Use of number line:



Then onto the vertical method:

72 ÷ 5 lies between 50 ÷ 5 = 10 and 100 ÷ 5 = 20

72
- 50 (10 groups) or (10 x 5)
22
- 20 (4 groups) or (4 x 5)
2

Answer : 14 remainder 2

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly.

Stage 5

Children will continue to use written methods to solve short division TU ÷ U.

Children can start to subtract larger multiples of the divisor, e.g. 30x

HTU ÷ U

196 ÷ 6

```
    32 r 4
6 ) 196      30x 6
  - 180      2x  6
    16
  - 12
    4
```

Answer : 32 remainder 4 or 32 r 4

Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 240 ÷ 52 is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 depends on the context.

Stage 6

Children will continue to use written methods to solve short division TU ÷ U and HTU ÷ U.

HTU ÷ TU

972 ÷ 36

Any remainders should be shown as fractions, i.e. if the children were dividing 32 by 10, the answer should be shown as $3\ ^{2}/_{10}$ which could then be written as $3\ ^{1}/_{5}$ in it's lowest terms.

Extend to decimals with up to two decimal places.

87.5 ÷ 7

```
   12.5
7 ) 87.5     10x 7
  - 70.0     2x  7
    17.5
  - 14.0     0.5x 7
    3.5
  - 3.5
    0
```

Answer : 12.5